

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3, and 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al, US Patent Application Publication 2004/0126993, in view of Adachi et al, US Patent Application Publication 2005/0081958.

Regarding claim 1, Chan teaches a method for producing a silicon-on-insulator structure including hydrogen implantation in a silicon wafer, chemical treatment of the wafer and a substrate, joining of the wafer and substrate, splicing and splitting of the wafer along a layer of the implanted hydrogen, the improvements wherein at least drying and removing of physically adsorbed substances from the surfaces of the wafer and substrate after the chemical treatment is carried out **(this treatment being the formation oxide film)** in a first vacuum at a first moderate temperature such that the implanted hydrogen stays bound [0029], and at least one of the joining and splicing of the wafer and substrate and exfoliating along the layer of implanted hydrogen is carried out **(this being the joining of the wafer and substrate)** at a second moderate

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temperature the same as or slightly higher than the first moderate temperature such that the implanted hydrogen mostly stays bound.

Chan fails to teach at least one of the joining and splicing being carried out in a second vacuum.

Adachi teaches at least one of the joining and splicing being carried out in a second vacuum [0101-0105] by teaching the joining of two wafers in a vacuum device equal to or less than 10 Torr and annealing at 500 degrees Celsius because bonding in this condition allows for the two wafers to be bonded without generating any bad bonding regions there between, resulting in a stronger bond between the two wafers.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Adachi with that of Chan because bonding in this condition allows for the two wafers to be bonded without generating any bad bonding regions there between, resulting in a stronger bond between the two wafers.

Regarding claim 3, Adachi teaches the hydrogen implantation is carried out with H_2^+ or H^+ ions with doses from 1.5 to $15 \times 10^{16} \text{ cm}^2$ and energies 20 to 200 keV, respectively [0095].

Regarding claim 6, Chan and Adachi fail to teach a thickness of thermally grown oxide SiO₂ on the substrate is 0.01 to 3 μm.

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 7, Chan teaches the substrate is glass [0023].

Chan and Adachi fail to teach the substrate has a thickness about 500 μm .

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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Regarding claim 8, Chan teaches the substrate is quartz [0011].

Chan and Adachi fail to teach the substrate has a thickness about 500 μm .

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 9, Chan teaches at least one of the first and second temperatures is 80 to 350°C for 0.1 to 100 hours and at least one of the first and second vacuums is 10 to 10⁴ Pa [0037].

Regarding claims 10 and 11, Chan teaches wherein at least one of the first vacuum or temperature is the same as the second vacuum or temperature [0036].

Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan and Adachi as applied to claim 1 above, and further in view of Chan, US Patent 6,274,459 (herein referred to as Chan'459, as cited in a previous Office Action).

Regarding claim 2, while Adachi teaches the hydrogen implantation is carried out through a thermally grown layer (figure 4), Chan and Adachi fail to teach the layer as a SiO₂ layer with a thickness of 5 to 50 nm.

Chan'459 teaches the hydrogen implantation is carried out through thermally grown oxide SiO₂ (column 6, lines 5-6) as a conventional type of layer that is used in the art to form an SOI wafer.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Chan'459 with that of Chan and Adachi because silicon dioxide is a conventional type of layer that is used in the art to form an SOI wafer.

Chan, Adachi, and Chan'459 fail to teach the SiO₂ layer has a thickness of 5-10 nm.

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or

any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 5, Chan and Adachi fail to teach thermal oxidation with following chemical etching with diluted hydrofluoric acid or a touch chemical-mechanical polishing (CMP) for removing an upper rough layer after the exfoliating.

Chan'459 teaches thermal oxidation with following chemical etching with diluted hydrofluoric acid or a touch chemical-mechanical polishing (CMP) for removing an

upper rough layer after the exfoliating (column 9, lines 53-67) as a conventional means in which to smooth a rough surface after a delaminating process.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Chan'459 with that of Chan and Adachi as a conventional means in which to smooth a rough surface after a delaminating process.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan and Adachi, as applied to claim 1 above, and further in view of Aga et al, US Patent 6,846,718 (as cited in a previous Office Action).

Regarding claim 4, Chan and Adachi fail to teach a thermal annealing is carried out at 1100° C during 0.5 to 1 hour after splitting.

Aga teaches is carried out at 1100° C during 0.5 to 1 hour after splitting (column 1, lines 60-67) as a means to improve the surface roughness of the SOI layer surface immediately after delaminating.

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Aga with that of Chan and Adachi as a means to improve the surface roughness of the SOI layer surface immediately after delaminating.

Response to Arguments

Applicant's arguments, see Amendment After Final, filed March 26, 2008, with respect to the rejection(s) of claim(s) 1-11 under 35 USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to QUOVAUNDA JEFFERSON whose telephone number is (571)272-5051. The examiner can normally be reached on Monday through Friday, 7AM to 3:30PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Fernando L. Toledo/
Primary Examiner, Art Unit 2823

QVJ